REPORT

OF THE

BOMBAY BACTERIOLOGICAL LABORATORY

FOR THE YEAR 1917

BY

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REPORT OF THE BOMBAY BACTERIOLOGICAL LABORATORY FOR THE YEAR 1917.

Staff.

Staff.

1. This report deals with the work carried out at the Laboratory during the year 1917. The Director of the Laboratory throughout the year was Lieut.-Colonel W. Glen Liston, C.I.E., M.D., D.P.H., I.M.S. He was assisted by the following officers :—

(1) Dr. D. A. Turkhud, M.B., C.M. (Edin.).

(2) Dr. S. N. Gore, L.M. & S.

(3) Dr. M. B. Soparkar, M.D. (Bombay).

Arrangement of the Report.

Arrangement of the Report.

2. As usual the report has been divided into two parts dealing with the work done under separate heads :—

(i) as the laboratory where all the antiplague vaccine used in India and its dependencies is made, and where investigations connected with plague are carried out ; and

(ii) as the Bombay Bacteriological Laboratory where work connected with preventive medicine and pathological diagnosis for the whole of the Bombay Presidency is carried out.

PART I.

Work connected with Plague.

(*a*) Routine work.

Output in doses of antiplague vaccine for the past five years.

3. The table below gives comparative figures of output in doses of antiplague vaccine for the past five years :—

1913.	1914.	1915.	1916.	1917.
795,637	812,942	827,407	1,404,003	1,821,661

This table shows that there has been a steady increase in the demand for antiplague vaccine and that during the year under report the Laboratory has despatched the largest number of doses on record.

Since the opening of the Laboratory in 1896 up to the end of the year 16,295,867 doses of the vaccine have been sent out.

Distribution of antiplague vaccine.

The distribution of antiplague vaccine in India and foreign countries during the last two years is shown below (figures represent number of doses) :—

Place or Province.	1916.	1917.	Place or Province.	1916.	1917.
Bombay Presidency and Sind ...	277,185	314,822	Burma ...	56,015	116,850
Madras Presidency ...	120,620	77,866	Native States in India ...	502,958	447,115
Bengal, Behar and Assam ...	9,260	16,531	Central India ...	...	60,615
United Provinces of Agra and Oudh.	76,750	154,325	Rajputana ...	...	32,545
			Ceylon ...	...	250
The Punjab ...	30,010	87,706	Countries outside India ...	188,445	353,331
North-West Frontier Province ...	900	2,050	Portuguese Territory in India ...	1,290	3,640
Central Provinces and Berar ...	140,570	154,015			
			Total number of doses ...	1,404,003	1,821,661

This statement shows that so far as inoculation is concerned the Native States in India make use of inoculation as a protective measure against plague to a greater extent than any Presidency or Province in India.

An increase in the demand for antiplague vaccine was particularly noteworthy in the Punjab, the United Provinces of Agra and Oudh, Burma and the North-West Frontier Province, while there was a remarkable decrease in the demand from the Madras Presidency.

The following table shows the monthly despatch of antiplague vaccine :—

Month.	1916.	1917.	Month.	1916.	1917.
January	102,880	235,461	August	135,460	170,435
February	94,530	126,645	September	151,405	162,440
March	135,425	138,715	October	200,270	255,246
April	26,980	132,460	November	236,756	222,896
May	16,755	94,246	December	215,542	184,010
June	19,920	46,722			
July	68,080	52,385	Total ...	1,404,003	1,821,661

Statistics of inoculation.

Statistics of inoculation.

4. It has not been possible to collect this year satisfactory statistics regarding inoculation. Replies to a Circular letter issued from this Laboratory to all who had received antiplague vaccine were frequently couched in the terms contained in the following letter from the Civil Surgeon, Dhárwár :—

"With reference to your letter dated 22nd February 1917, I have the honour to inform you that I cannot give you any statistics which are worth anything.

"In nearly every case the Sub-Assistant Surgeon of a Dispensary, hurries to a distant village, inoculates all he can and hurries back again. He has no time to do anything but count the people and take the names and has no opportunity of seeing them again.

"All I can say is that the people of this district have learned by experience that inoculation is a good thing, and that the demands for visits from inoculators are in excess of what we can comply with."

The following extract from a letter from the Chairman, Wai Municipality, is of interest :—

"The total number of persons inoculated is 4,378, *i.e.*, nearly half the population of Wai submitted itself to inoculation very willingly.

"People who actually moved out of the town number only 1,773. The rest of the people were able to stay at home because a large number of them were protected by the inoculation.

"The serum was received in time and afforded a good help to the people who have taken kindly to it and come of their own accord for inoculation.

"It may be mentioned that inoculation was done more by private practitioners, one of whom was a Native Vaidya. This fact is mentioned to show the growing popularity of the measure even among the classes who have received no English education or any education at all. No rewards were given to persons who were inoculated, but it is heard that one of the practitioners charged a small fee of two annas per head for inoculation. This practitioner was not provided with serum by the Municipality. He performed nearly one thousand inoculations. This will prove beyond doubt the efficacy of inoculation, its growing popularity among the people of Wai."

The Vaidya referred to above came to Bombay and went through a course of instruction in inoculation at the Laboratory. I am satisfied that he could inoculate people satisfactorily.

The Chairman's letter refers to the fact that certain unofficial inoculators charged the people for inoculating them. I am of opinion that in view of the fact that it is very difficult at the present time to secure official inoculators, private medical practitioners should be encouraged to carry out inoculation and be allowed to charge for the same, provided they are able to secure a certificate from a competent authority, they are able to perform the operation

and that they furnish the inoculated with certificates in the usual form sending one copy to the Civil Surgeon of the district.

(*b*) Assistance and Advice rendered.

Examination of rats for plague.

5. The Health Department of the City of Bombay continued sending to the Laboratory all rats found dead or caught alive within the municipal limits. With each rat a note was received indicating where it had been caught or found, so that after examination it was possible to inform the Health Officer where plague-infected specimens had been picked up. The Health Officer was thus able to adopt suitable measures to check the progress of the disease in the different parts of the city.

During the year 1917 nine hundred and ninety-five thousand six hundred and forty-two rats were received at the Laboratory. Of this number three hundred and two thousand one hundred and fifty were alive when received and six hundred and ninety-three thousand four hundred and ninety-two were dead. Of the latter five hundred and one thousand seven hundred and forty-two were examined and among them eleven thousand one hundred and seventy-five were found to be plague-infected.

The following table shows the progress of plague each half month among men and rats in Bombay City during the year 1917. The figures which refer to men record the number of deaths from plague each half month. The figures showing the progress of the disease in rats are given separately for Mus rattus and Mus decumanus. These figures have been calculated from the number of rats found infected at the examination made at the Laboratory on every day of the week except Sundays and Holidays; from the actual figures obtained a figure has been calculated for all the days of each half month and these are the figures recorded :—

Return of rats examined during the year 1917.

Period 1917.	Human plague mortality.		Plague-infected rattus.		Plague-infected decumanus.	
	Number of deaths from plague.	Percentage above and below mean for the year.	Figures calculated for each half month.	Percentage above and below mean for the year.	Figures calculated for each half month.	Percentage above and below mean for the year.
1st to 15th January ...	17	−75	79·6	−11	276·9	−44
16th to 31st January ...	30	−57	93·7	+5	364·6	−26
1st to 15th February ...	37	−46	101·5	+13	520·4	+6
16th to 28th February ...	57	−17	87·1	−3	644·8	+31
1st to 15th March ...	103	+49	86·2	−4	857·5	+74
16th to 31st March ...	160	+132	169·3	+89	1,193·3	+148
1st to 15th April ...	163	+136	136·5	+53	1,215·0	+147
16th to 30th April ...	188	+172	195·0	+118	1,352·3	+175
1st to 15th May ...	149	+116	174·2	+95	1,043·1	+112
16th to 31st May ...	153	+122	104·0	+16	790·9	+61
1st to 15th June ...	64	−7	67·5	−25	395·0	−20
16th to 30th June ...	72	+4	68·7	−23	357·5	−27
1st to 15th July ...	64	−7	95·0	+6	376·2	−23
16th to 31st July ...	67	−3	70·2	−22	290·5	−41
1st to 15th August ...	59	−14	53·2	−41	265·9	−46
16th to 31st August ...	50	−28	44·6	−50	217·1	−56
1st to 15th September ...	39	−43	43·7	−51	216·2	−56
16th to 30th September ...	30	−57	40·5	−55	192·0	−61
1st to 15th October ...	25	−64	63·5	−29	177·7	−64
16th to 31st October ...	44	−36	57·3	−36	202·7	−59
1st to 15th November ...	24	−65	102·3	+14	204·5	−58
16th to 30th November ...	24	−65	87·7	−2	199·6	−59
1st to 15th December ...	16	−77	56·2	−37	203·7	−59
16th to 31st December ...	27	−61	69·8	−22	240·0	−51
Total ...	1,662					

(*c*) Educational Work.

6. During the year 28 medical gentlemen attended the Laboratory for a course of instruction in the technique of inoculation. A number of medical men also attended the Laboratory for practical instruction in detecting plague-infected rats.

PART II.

Work of the Laboratory as the Provincial Bacteriological Laboratory.

(*a*) Routine Work.

I.

Examination of Pathological Fluids and Discharges, water and foodstuffs, etc.

Examination of Pathological Fluids and Discharges, water and foodstuffs.

7. (1) Blood sera for agglutination for typhoid, paratyphoid and Malta fevers, etc.—1,624 specimens.

(2) Blood for Wassermann—1,963.

(3) Blood smears—2,223.

(4) Sputa for tubercle or other organisms—222.

(5) Throat swabs for diphtheria, meningococcus, pneumococcus, etc.—190.

(6) Urine and Fæces—

Urine for general estimation, tubercle, cholera, bilharziasis, etc.—211.

Fæces for cholera, dysentery, typhoid, etc.—384.

(7) Pus for gonococci, tubercle, preparation of autovaccine and other examinations—90.

(8) Fluids and discharges—38.

(9) Cultures of organisms sent for identification—660.

(10) Blood smears from rats, cats and squirrels for the presence of bacillus pestis—132.

(11) Specimens examined for the presence of lepra bacilli—4.

(12) Milk—samples of dairy milk 477, samples of condensed milk 54—total 531.

(13) Water—chemical examination 181, bacteriological examination 88—total 269.

(14) Foodstuffs—69.

(15) Miscellaneous examinations of drugs, metal, mineral products, salt, stains, field dressings, etc.—56.

(16) Vaccines tested for sterility—22.

(17) Insecticides and disinfectants examined—20.

(18) *Post-mortem* examinations carried out on animals received from the Victoria Gardens—49.

8. The following vaccines, etc., were prepared at the Laboratory and supplied both to military and other bodies in and out of India:—

Autogenous vaccines	...	7,044 doses.
Stock vaccines—		
Staphylococcus and Streptococcus	...	20,277 „
Gonococcus	...	9,372 „
B. acne (mixed)	...	5,012 „
Tuberculin	...	545 „
Pneumococcus	...	1,067 „
Anticholera	...	6,628 „
Sensitised dysentery	...	6,650 „
Dysentery	...	2,537 „
Mixed TAB	...	2,716 „
Antityphoid	...	285 „
Paratyphoid A and B	...	2 „
Dead emulsion of typhoid and paratyphoid A and B	...	82 c. c.
Different cultures supplied	...	8 times.

In addition, bacteriological apparatus, chemicals, stains, anti-toxic sera, etc., were supplied to the War Hospitals in India and outside.

Fumigation with Hydrocyanic acid gas was carried out at the War Hospital at Colába, at the 34th (The Welsh) General Hospital, Deolali, and the Hospitalship *Sicilia*. The kit of the Indian soldiers at Santa Cruz and of the British soldiers of the Mechanical Transport Depôt was treated in the Hydrocyanic fumigation chamber at the Alexandra Docks.

II.

Pathological tissues for diagnosis.

Classification of morbid tissues sent for examination.

9. I.—Tumours :—

A.—*Non-Malignant.*

1.	Fibroma	4	
2.	Osteo-fibroma	2	
3.	Adeno-fibroma	2	
4.	Lipoma	2	
5.	Fibro-lipoma	1	
6.	Myxoma	1	
7.	Fibro-myxoma	1	
8.	Myoma	2	
9.	Hæmatoma	2	
10.	Papilloma	3	
11.	Polypus	1	
12.	Staphyloma	1	
13.	Fibro cystic adenoma	1	
14.	Cystic adenoma	1	
15.	Fibro angioma	1	
16.	Myxo-chondroma	1	
			26

B.—*Malignant.*

1.	Carcinoma	21	
2.	Encephaloid carcinoma	1	
3.	Scirrhus carcinoma	2	
4.	Glandular carcinoma	4	
5.	Epithelioma	20	
6.	Glioma	2	
7.	Endothelioma	3	
8.	Rodent ulcer	1	
9.	Spindle-celled sarcoma	4	
10.	Round-celled sarcoma	2	
11.	Melanotic sarcoma	2	
12.	Sarcoma (undifferentiated)	2	
			64

II.—Granulomata.

Syphilitic	9	
Tubercular	27	
		36

III.—Other pathological conditions.

Acute inflammation	3	
Cysts of different varieties	7	
Malaria	2	
Myositis ossificans	1	
Acute Yellow atrophy	1	
Hodgkin's disease	1	
Pneumonic lung	1	
Plague	1	
Ulcer	1	
Endometritis	1	
Tissues found to be normal	5	
Tissues found to be non-malignant	14	
No definite diagnosis	19	
Miscellaneous pathological conditions	104	
		161
Total		287

III.

Diagnosis of Rabies.

Examination of dogs, etc., for rabies.

10. The following is the statement of the examination of brains of dogs and other animals for the diagnosis of rabies during the year 1917 :—

Bombay—	
Through the Bombay Veterinary College	34
Through the Bombay Police	33
Through the Bombay Municipality	4
Through private owners	15
From other places in Bombay	3
Outstations	63
Total examined	152

The result of the examination of these brains was as follows :—

Received in a condition unfit for examination	14
No evidence of rabies	14
Suspicious although no definite "Negri bodies" found	11
Negri bodies found, brains obtained from rabid animals	113

IV.

Snakes.

Snakes.

11. Poisonous snakes received at the Laboratory :—

Place.	Cobras.	Russell's viper.	Krait.	Echis.
Bombay Presidency ...	18	12	1	296
Central Provinces ...	17	15	...	...
Rajputana ...	11	...	...	...
Bengal ...	...	1	...	...
Total ...	46	28	1	296

Total number of snakes received 371.

V.

Mosquitos examined.

Mosquitoes.

12. During the year under report 110 specimens of mosquitos have been identified.

(*b*) Research Work.

I.

Schistosomiasis.

13. Dr. Soparkar continued his inquiry in connection with Schistosomiasis with the view to determine whether the introduction into India of the disease by troops returning from Egypt and Africa was likely to be a danger to this country. The disease in Egypt and other parts of Africa is caused by two different species of worms, which cannot be transmitted directly from one person to another but which must pass one stage of their development in man and another stage in certain species of fresh-water snails to complete their life-history. It has been proved that each species of worm requires for this purpose a different intermediary snail, *viz.*, *Bullinus* for the transmission of *Schistosomum* hæmatobium, and *Planorbis* for *Schistosomum mansoni.* Most of the cases imported into this country were infected with *S. hæmatobium.* Enquiries have shown that *Planorbis* occurs in large numbers in India but the specimens of the latter obtained in Bombay differ somewhat from those obtained from Egypt. Experimental infection of these local *Planorbis* snails

with "Miracidia" from the ova passed by patients suffering from *S. hæmatobium* proved unsuccessful, for the obvious reason that the known carrier for S. hæmatobium is *Bullinus* and not *Planorbis*. Opportunities for infecting local *Planorbis* with the miracidia of *S. mansoni* did not occur sufficiently often, and certain difficulties were experienced in keeping the experimental snails alive for any length of time; these, however, are being overcome and further experiments in this direction are in progress.

The reported absence of *Bullinus* in India, however, needs confirmation and a survey of the fresh-water molluscs in the parts of India irrigated by fresh-water canals appears to be necessary.

During the course of these investigations seventeen different types of cercaria were obtained from the several specimens of snails collected in and around Bombay, and one species of cercaria was met with which closely resembled that of human Schistosome. The life-history of this species was successfully investigated, and mature worms were obtained from the body of a goat which had been artificially infected through the skin with these cercaria. The worms on examination were found to be *S. spindalis*, and they eventually developed cercaria identical with those used for infecting the goat.

A systematic examination of a number of animals killed in the Slaughter House at Bandra showed that a certain number of sheep and goats were naturally infected with a Schistosome resembling *S. indicum*, while *S. indicum* and *S. spindalis* were met with in a few cows and bullocks, and *S. indicum* in a buffalo.

A species of *clinostomum* was found in a large number of mosquito-destroying fish *Polycanthus cupanus*.

II.

Isolation of typhoid bacilli from fæces.

14. Dr. S. N. Gore has been engaged in studying various methods for the isolation of typhoid and allied organisms from "carriers". He has been able to show that by a simple process of dilution, using a platinum loop and saline solution, he can obtain isolated colonies on ordinary agar slopes in test tubes planted with suitable dilutions of an emulsion of fæces. He has further been able to prove that with a little practice and experience it is possible to distinguish colonies of typhoid and allied bacilli from the normal flora of the intestine when grown in this way. The use of elaborate and expensive culture media for the purpose of isolating typhoid bacilli from carriers is not necessary provided two conditions are fulfilled, *viz.*:—(1) that isolated colonies are obtained on agar slopes, (2) that not fewer than fifty isolated colonies including all types are examined from a single specimen.

The use of this technique will enable all cases of typhoid fever and allied disorders to be examined before they are allowed to resume their normal duties. Attention to the bacteriological examination of all cases of typhoid fever and allied diseases by medical practitioners will materially assist in reducing the incidence of typhoid fever in India; this is a matter of no small moment in a country where this disease is so common as to be sometimes designated the white man's plague.

(*c*) Assistance and advice rendered.

Assistance to Military authorities.

15. The Laboratory continued as usual to give assistance in the bacteriological and pathological examination of specimens obtained from all Military hospitals in Bombay.

Enteric Depot.

16. The Depôt which was opened in 1916 for the examination and treatment of soldiers convalescent from enteric fever was continued throughout the year. A detailed report of the work done has been submitted separately to the Military authorities as well as to the Local Government.

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(*d*) EDUCATIONAL.

Popular lectures.

17. Lectures illustrated with cinema films and demonstrations were given at the Sanitary Conference at Karachi in October 1917, and a lecture on plague was given at Ahmedabad illustrated with lantern slides and cinematograph films.

18. A perusal of this report will show that the work of the Laboratory has greatly increased during the year. The difficulties of obtaining supplies from England and the pressing demands made on the Laboratory owing to the War have called forth the most strenuous efforts from all the staff of the Laboratory. I take this opportunity of thanking them for their loyal co-operation and help.

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